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**NAVY PUBLIC WORKS CENTER  
NORFOLK, VIRGINIA  
UTILITIES DEPARTMENT**

**STANDARD OPERATING PROCEDURE / JOB HAZARD ANALYSIS**

**TITLE**  
**INSTALL OVERHEAD ELECTRICAL CONDUCTORS**

**PROCEDURE NUMBER**  
**WC 624 HVE 023**

**DISTR:**  
**601A**  
**610**  
**620**  
**WC 624**

**SIGNED:** \_\_\_\_\_  
**(DATE)**

**APPROVED:** \_\_\_\_\_  
**(DATE)**

**SAFETY PROFESSIONAL:** \_\_\_\_\_  
**(DATE)**

**MANAGEMENT OFFICIAL:** \_\_\_\_\_  
**(DATE)**

**DATE:** \_\_\_\_\_ **REVISION DATE:** \_\_\_\_\_

## INSTALL OVERHEAD ELECTRICAL CONDUCTORS

### **Purpose:**

Procedure to install overhead conductors onto a distribution pole line.

### **Potential Energy Sources:**

1. Energized circuits in close proximity of work.
2. Deenergized circuits which are not included in the work and have not been grounded.

### **Tools and PPE:**

Tools: Bucket truck, hand line, hot hoist, wire grips, rubber hoses, rubber blankets. PPE: Nomex coveralls, Nomex hood, insulating rubber gloves, insulating rubber sleeves, hard hat, safety shoes, work gloves, safety glasses, orange vest, safety harness, and back brace if required by back injury prevention and control program. The class of rubber gloves and sleeves will depend on the exposure voltage as per the following: Class 0 - up to 1,000 volts, Class 1 - up to 7,500 volts, Class 2 - up to 17,000 volts, Class 3 - up to 26,500 volts, Class 4 - up to 36,000 volts.

### **References:**

1. PWC Occupational Safety and Health Program Manual, PWCNORVAINST 5100.33E
2. SOP WC 624 HVE 001, Set Up and Secure Bucket/Auger Truck
3. Occupational Safety and Health Standards for General Industry (29 CFR PART 1910): Subpart I, Personnel Protective Equipment; Subpart R, Electrical Power Generation / Transmission / Distribution; Subpart S, Electrical
4. NFPA 70 E approach distances to exposed, energized, electrical conductors and circuit parts.
5. ANSI C2-1987 National Electrical Safety Code
6. Electrical Transmission and Distribution Safety Manual, P-1060
7. The Lineman's and Cableman's Handbook, 5th ED
8. SOP WC 622 HVE 013, Deenergization, Lockout, Tagout
9. SOP WC 622 HVE 007, Switchout and Switchback Energized Circuit

### **Procedures:**

1. Set up bucket truck. Refer to SOP WC 624 HVE 001, Set Up and Secure Bucket/Auger truck for details. Note - The job may require several bucket truck set ups. Refer to SOP WC 624 HVE 001 each time.

## INSTALL OVERHEAD ELECTRICAL CONDUCTORS

2. When operating a bucket truck the following safety rules will be followed.
  - a) Only an authorized person, one with a current government license to operate an aerial lift, will operate the bucket.
  - b) Do not use the bucket truck if winds exceed the truck manufacture's specified limit.
  - c) Do not perform energized work in wet weather.

d) Personnel in bucket will wear a safety harness with a lanyard attached to the boom or bucket.  
e) Do not exceed the bucket's weight limitations.  
f) Stand firmly on the floor of the bucket with both feet.  
Do not sit on the bucket's edge or use planks, ladders, or other such devices.

3. Insulate energized conductors within 3 feet of the work area. Insulate deenergized overhead circuits within 3 feet of the work area which are not included in the work and have not been grounded as per Lockout and Tagout procedures. Personnel in the bucket shall wear Nomex coveralls, Nomex hood, safety glasses, safety shoes, insulating rubber gloves and sleeves, and hard hat.

4. The following rules will apply to job.

a) Bucket personnel working poles which have energized circuits or circuits which have not been properly grounded will wear Nomex coveralls, safety glasses, safety shoes, hard hat, safety harness, insulating rubber gloves insulating rubber sleeves, and a back brace if required to wear. The circuits in question have been insulated per Step 3.

b) Bucket personnel working on poles which have all other high voltage circuits deenergized and properly grounded, or which have no other circuits on the poles, will wear hard hats, work gloves, safety shoes, safety harness, safety glasses when required, and a back brace if required to wear

c) Personnel in the bucket will carry a hand line aloft with them.

d) Ground personnel will wear hard hats, safety shoes, work gloves, and safety glasses.

e) Ground personnel will wear orange vests if working adjacent to a road or in a parking lot.

f) Ground personnel not involved with the work will watch the personnel working aloft.

g) Ground personnel will stay clear of area underneath the bucket unless the work dictates.

#### INSTALL OVERHEAD ELECTRICAL CONDUCTORS

h) If ground personnel are present, then at least one of them will have been trained to operate the bucket in an emergency situation where the bucket personnel are no longer able to operate the bucket controls.

5. Pull out conductors on the ground - Set up cable trailer, or jack stands with reel of wire, at one dead end pole. Pull wire the entire length of the job if possible. The cable reel may have to be set up several times if the job is too long for one pull. When several pulls are required the wire will have to be sleeved

together or double dead ends will have to be used. Tap-off or transition poles will have to be considered when deciding where to split the pulls.

6. Place conductors on the insulators of all cross arms between the dead end poles - Bucket personnel will use a hand line to transport the conductors to the top of the pole. Place the conductors onto the insulators. Repeat these steps till all conductors have been placed on all poles.

7. Attach conductors to one of the dead end poles - Bucket personnel will attach bell type insulators to the eye nuts on the dead end arm. The ground personnel will attach dead end shoes to the conductors. The bucket personnel will hang a hand line on the cross arm so the ground personnel can hoist the conductors aloft. The bucket personnel will then attach the dead-end shoes to the bell-type insulators. If jumpers will be required, the ground personnel will leave enough tail when attaching the dead end shoes.

8. Attach conductors to opposite dead end pole - Ground personnel will make up bell type insulators into sets. The number of insulators in each set will depend on the circuit's voltage. The number of sets will be determined by the number of phases in the circuit. The ground personnel will attach dead end shoes to the insulator sets. The bucket personnel will attach the insulators to eye nuts on the dead end pole's cross arm. The bucket personnel will hang hand lines onto the cross arm where the two outside conductors are to be attached and will place hot hoists, or slack blocks, with a wire grip attached, to the dead end shoes on the insulators. The ground personnel will attach the conductors to the hand lines with wire grips and hoist the conductors aloft. The bucket personnel will attach the hoists, or blocks, via their wire grips, when as much of the conductor slack as possible has been removed by the ground people. The persons aloft will release the hand lines and wire grips attached by the ground personnel. The bucket personnel will then jack the conductors to the proper sag and tension using the hot hoists or slack blocks. Pull the conductors to the proper sag as per the lineman's judgment and experience, and as per the attached sag tables from the

#### INSTALL OVERHEAD ELECTRICAL CONDUCTORS

Lineman's and Cableman's Handbook, 5th ED . Excess conductor tail will be cut off and the installer will bolt the conductor to the dead end shoes. Release the hoists, or blocks, and grips from the conductors and dead end shoes. Repeat the entire process for the center conductor.

9. Place the conductors on the new insulators and secure them - The exact method will depend on work conditions and mechanic's judgment. A conductor should be placed so the securing tie wire

will have minimum strain on it. An insulator and pin is to take the strain of a conductor. The tie wire just holds the conductor in place. Some general rule for tie wires are as follows:

- a) the tie wire will be the same kind of wire as the conductor, copper tie  
for copper wire, aluminum tie for aluminum wire, covered tie for covered conductor
- b) use soft annealed wire
- c) use solid wire
- d) never reuse a tie wire
- e) in general use #6 tie wire for conductors #4 and smaller, and use #4 tie wire for conductors greater than #4

Secure the conductor tightly via standard tying methods as any looseness between the tie wire, conductor, and insulator will lead to chafing and injury to the conductor. When several pulls were used to pull in the conductors, jumpers will be required. Tap off and transition poles will also require jumpers. If possible the jumpers should be secured to the cross arm, or pole, with pins, insulators, and tie wires. Compression or mechanical connectors are acceptable to attach the jumper to the conductors. Application and availability will determine which connection method is used.

10. Connect the circuit to the distribution system by making hot jumpers or close switches. For installations where all the load can be isolated/transferred from the newly installed circuit, no circuit fuse protection is required, or no circuit isolation is required, it is acceptable to connect jumpers from the new conductors to existing energized conductors. If the above conditions can not be met, then circuit switches must be installed. When circuit fuse protection is required, fused disconnects will be installed as per the appropriate SOP. Line tension or blade switches will be installed as per the appropriate SOP when circuit isolation is required. Leave all installed switches in the open position. WC 622 personnel will be responsible to close the switches.

Note - Refer to attached LANTDIVENGCOM Pole Line Plates for further information on the procedures above.

#### INSTALL OVERHEAD ELECTRICAL CONDUCTORS

11. Remove insulation placed on energized conductors. Remove insulation placed on conductors which are not included in the work and have not been grounded as per Lockout and Tagout procedures. Personnel in the bucket shall wear Nomex coveralls, Nomex hood, safety glasses, safety shoes, insulating rubber gloves and sleeves, and hard hat. Remove insulation in reverse order that it was placed.

12. Secure bucket truck. Refer to SOP WC 624 HVE 001, Set Up and Secure Bucket/Auger Truck, for details.